Windows 2003

HP StorageWorks Hardware Providers administration guide

EVA4000
EVA6000
EVA8000

product version: 3.0

first edition (May 2005)

part number: T1634-96050

This guide explains how to install and administer HP HWP for use with HP EVA disk arrays and Windows Server 2003.

Printed in the U.S.A.

HP StorageWorks Hardware Providers for Windows 2003: Administration Guide
product version: 3.0

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Contents

About this guide

This guide explains how to install and administer the HP StorageWorks VDS and VSS Hardware Providers (HWP) software for HP StorageWorks EVA disk arrays. The array models covered are listed on the title page.

Intended audience

The instructions in this guide are intended for system administrators who have the following skills and knowledge:

- Familiarity with the EVA family of disk arrays
- Familiarity with EVA array software, such as Command View
- Expertise with the Windows 2003 operating system and its file system

This document does not contain detailed information about using CommandView EVA for configuring LUNs. Refer to the CommandView EVA documentation if you need more detailed information.

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Enterprise Virtual Array: Owner's Guide*

For information about Windows software, operating system commands, and third-party products, refer to the manufacturer's documentation.

Getting help

If you have questions after reading this guide, contact an HP authorized service provider or access our website:

www.hp.com

HP storage website

The HP storage website has the latest drivers and information about this product. Select the appropriate product or solution from this website:

thenew.hp.com/country/us/eng/prodserv/storage.html

HP technical support

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thenew.hp.com/country/us/eng/support.html

From this website, select the country of origin.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

HP authorized reseller

You can obtain the names of HP authorized resellers by telephone:

United States	1-800-345-1518
Canada	1-800-263-5868
elsewhere	See the HP website for locations and telephone numbers: www.hp.com

Conventions

This guide uses the following text conventions.

page 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
www.hp.com	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
variable	Italics indicates that you must supply a value. Italics is also used for manual titles.
`input/output`	Monospace font denotes user input and system responses, such as output and messages.
Example	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[ ]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
|	Separates alternatives in a list of options.

Revision history

May 2005	New manual for EVA arrays.

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1

Overview

This chapter describes the HP StorageWorks Hardware Providers (HWP) for Windows 2003 and explains how they operate with Microsoft's operating system and applications.

When you have read this chapter, you should have a functional understanding of the Hardware Providers that will prepare you to install the providers and get them working.

Simple overview

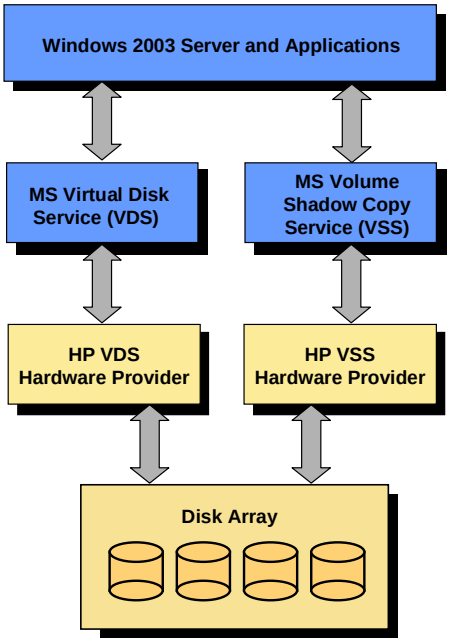
HP StorageWorks Hardware Providers for Windows 2003 are solutions that are installed on a Windows 2003 server connected to an HP disk array.

There are two providers associated with two Microsoft storage services:

- HP VDS HWP and Microsoft Virtual Disk Service (VDS)
- HP VSS HWP and Microsoft Volume Shadow Copy Service (VSS)

The purpose of the Hardware Providers, together with the Microsoft services, is to enable the Windows OS and applications to do these tasks:

- VDS: manage the disk array using the Windows OS and applications
- VSS: create copies of data on array volumes for backup



Detailed overview

HP Hardware Providers enable Windows and its applications to use Microsoft VDS/VSS services to manage certain functions of the disk array.

Virtual Disk Service (VDS)

The VDS service provides the capability of Windows and Windows applications to recognize the HP disk array and perform basic and dynamic disk management functions.

- Microsoft Management Console (MMC) Snap-in, Disk Manager and DiskPart command line interface use the VDS service.
- When used with HP VDS HWP, Windows and Windows applications can perform disk array LUN and port management tasks normally performed using proprietary array control software.

Volume Shadow Copy Service (VSS)

Through the HP VSS HWP, the VSS service provides mirroring of the active files or databases on primary array volumes to secondary array volumes for backup and restoration. The service performs these functions:

- Coordinates with business and backup applications to control the disk array through the HP VSS HWP to make copies of array volume(s)
- Makes full copies of data, called **volume shadow copies**, **clones**, or **plexes** by Microsoft. (See the Glossary.)

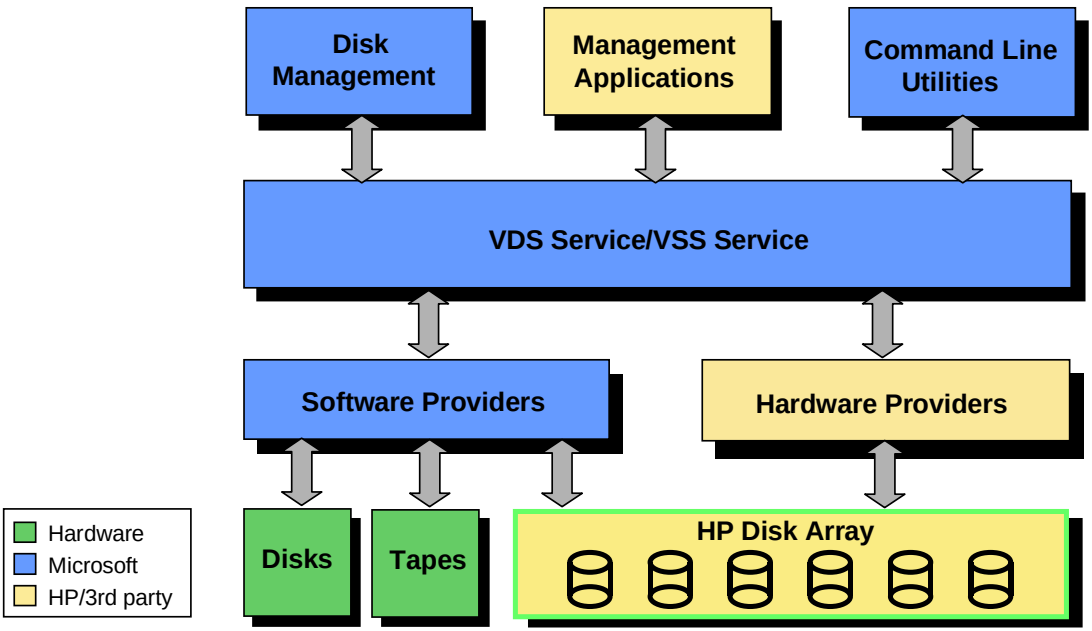
For detailed information about the Microsoft VDS and VSS services, see this Microsoft website:

http://www.microsoft.com/windowsserversystem/storage/technologies/shadowcopy/stormgtusingvdsvss.mspx

Functional components

The process of managing array volumes using VDS/VSS and HP HWP involves the following components:

- Microsoft Windows Server 2003 OS
- Windows Disk Management
- Management Applications, such as HP FRS and third party programs
- Microsoft Command Line Utilities
- Windows Software Providers
- Windows VDS Service/VSS Service
- HP VDS/VSS Hardware Providers
- HP Disk Array System



Microsoft Windows Server 2003 operating system

Third party management applications, such as HP StorageWorks Fast Recovery Solution (FRS), work with the Microsoft VDS and VSS services to allow you to manage array disks and volumes and to perform data backup and restoration. For more information about FRS, see the *HP StorageWorks FRS XP Administration Guide*.

Windows Disk Management

Windows Disk Management consists of the Windows software and user interfaces that enable you to manage disks, volumes, and file systems. The user interface for disk management is included in the Computer Management tool within the Administrative Tools Control Panel.

Management applications

Third party management applications, such as HP StorageWorks Fast Recovery Solution (FRS), work with the Microsoft VDS and VSS services to manage array disks and volumes and to provide data backup and restoration. For more information about FRS, see the HP website.

Microsoft command line interfaces

Microsoft offers two command line utilities: DiskPart and DiskRaid. These interfaces enable you to script disk management tasks so you can automate configuration of multiple storage disks.

The DiskPart utility, which comes standard with Windows XP and Windows Server 2003, manages disks, volumes, and partitions. Using DiskPart, you can use the command line to manage the disk array.

The DiskRaid utility, which comes with the Windows 2003 Server Resource Kit, configures hardware RAID subsystems. It works with any storage hardware that includes a VDS hardware provider, including HP arrays using the HP VDS HWP. DiskRaid has a command syntax similar to DiskPart. Note that if you display LUNs, DiskRaid shows LUNs in decimal rather than the hexadecimal numbering used in Command View.

Windows software providers

The Microsoft Software Providers (called Basic Disk Provider and Dynamic Disk Provider) interface between the Windows OS, Windows applications, and disks, drives, and disk arrays. Through these software providers and VDS, Windows sees the disks, drives, and disk array volumes and performs actions such as partitioning, mounting, and managing the file system.

Other Windows software providers (not shown) are the in-box providers, such as the Windows Backup utility and Windows Microsoft Software Shadow Copy Provider. These providers allow individual users to back up and recover user volumes and files.

HP Hardware Providers are not required in order for the Microsoft in-box or third party software providers to perform the tasks described above on the HP disk arrays. However, the HP HWPs extend the capabilities of various Windows providers and applications to do additional tasks that normally require the use of proprietary HP array management software. Such tasks include LUN and port management and more sophisticated volume copying.

Microsoft Virtual Disk Service (VDS)

Microsoft VDS provides a mechanism for managing volumes and logical units. Administrators can identify, configure, and monitor supported HP StorageWorks disk array volumes from the Windows Server 2003 Microsoft Management Console (MMC).

When used with HP disk arrays, VDS manages the array to make it appear like a Windows disk for Windows applications. When you use Microsoft Management Console, Windows Disk Manager and the Microsoft DiskPart or DiskRaid utility to control the array, your commands are sent to the array through VDS and the software or hardware providers.

VDS performs the following functions:

- Coordinates providers and clients (local and remote)
- Performs binding
- Discloses hardware LUNs to software disks
- Performs common file system functions
- Monitors volume status
- Provides fault and performance tracking
- Includes an API layer

Microsoft Volume Shadow Copy Service (VSS)

Microsoft's VSS manages creation and maintenance of data shadow copies for backup and recovery. VSS creates shadow copies across multiple volumes in coordination with HP's Fast Recovery Solution or other third party business applications, file-system services, backup applications, and storage hardware.

When directed by the backup application, VSS coordinates with the writer, application, and hardware providers to perform shadow copying. The shadow copies contain static copies of all files, such as databases, transaction logs, and checkpoint files. Because VSS coordinates copying, the files are copied in a defined state.

Copy terminology

Understanding how Microsoft VSS terminology corresponds to standard IT industry terms for data copying makes it easier to understand what VSS does. The following paragraphs explain the terminology.

Microsoft generally refers to a VSS copy as a "volume shadow copy." When created using HP FRS and HWP, this type of copy is a static replica of an original volume's contents. It is keyed with a GUID to allow identification of the parts of a shadow copy set that span multiple volumes. Microsoft also refers to a VSS copy as a "plex." This type of copy is commonly referred to in the IT industry as a "split mirror."

When you use an EVA array to make a shadow copy, the array makes what is known as a "snapclone." An EVA Snapclone is a complete clone copy of a specified Virtual Disk (LUN). EVA snapclones are available almost immediately. This is accomplished by creating a point-in-time copy and making it immediately available by pointing to data on the original volume while continuing to copy data to a secondary volume in the background. When copying is complete, the snapclone is a static point-in-time copy of the original.

HP VDS/VSS Hardware Providers

Windows Server 2003 sees, partitions, mounts, and manages file systems on the disk array using its own software providers. HP's Hardware Providers extend the array management capabilities of Windows and its applications to include functions normally performed using the disk array's proprietary control software. These functions include managing disk array LUNs and ports and performing volume copy operations.

There are two HP HWP installation executables for each HP disk array model, one installation executable for VDS and one for VSS. These installation executables are different for each HP disk array model.

The HP Hardware Providers installation executables install the HWP files in your Windows Server file system. The files installed consist of special sets of HP DLLs and executables. These components extend the array management capabilities of Windows and its applications. Because they are installed separately, you can choose to install only the VDS or VSS HWP or both.

For VSS only, HP's Business Copy (BC) application, which installs on the disk array and is licensed in Command View, works with the VSS and the HP HWP components to enable the array to make VSS shadow copies. For functional purposes, you can think of BC as a part of the hardware providers, even though it is installed separately.

HP disk arrays

Specific HP Hardware Providers have been created to work with selected HP disk arrays. Different supporting technologies and features within the arrays result in some differences in their methods and capabilities of performing VDS/VSS tasks.

HP EVA arrays and VSS

The HP EVA VSS Hardware Provider works with EVA arrays to enable Microsoft VSS to perform snapclone setup and management. During HP VSS HWP installation you specify an EVA disk group to hold the copies.

HP HWP typical applications

The following examples demonstrate typical applications of the Hardware Providers when used with the Microsoft VDS, and VSS software components. Many more scenarios are possible.

VDS typical applications

The advantage of VDS and the HP VDS HWP is that they allow you to manage the HP disk array using the Windows interface. Array management tasks that would normally require the array's proprietary management application can be done using VDS and the third party Windows management application of your choice. When you have multiple array models, this is particularly helpful because you can manage all arrays from a single interface.

VSS typical applications

VSS shadow copies made on the disk array with the help of the HP VSS HWP can be used for many purposes:

- Consistent backups of open files and applications
- Transportable shadow copies for backup, testing and data mining
- Fast recovery of files and data

Consistent backups of open files and applications

VSS captures data files from running applications by taking a snapshot of the data at a point in time, minimizing interruption to the applications. This process may include cooperation from the applications, which notify the operating system that they are momentarily pausing. During this time, the applications make data on the disk consistent by performing actions such as flushing buffers to disk or writing data in memory to disk. The resulting backup data copies are typically temporary, maintained for some limited period of time until they are superseded by newer copies.

Shadow Copy Transport

Using a server configured with suitable applications together with VSS and the HP HWP, you can create shadow copies and import them onto other servers connected to the same disk array. This enables multiple servers to make use of the same data, allowing data mining or testing on those servers. (However, shadow copies are read-only. If you need to write to a shadow copy, you must use a storage-management application that works with VDS/VSS to convert the copy to read/write.)

You can also use VSS and HP HWP to create and transport shadow copies from the primary server onto a backup server, and then back up the shadow copy volumes to tape. The advantage of this solution is that it relieves the primary server of backup traffic. Additionally, shadow copies can be made more often than tape backups because the copying process is faster than tape and doesn't require taking the database offline.

Fast Recovery

HP StorageWorks FRS Fast Recovery is an HP management application that works with VSS and HP VSS HWP. Using FRS, you can create point-in-time shadow copies and use them to perform quick recovery of an Exchange Server storage group or an SQL database. Whether the database is lost because of a hardware failure or software corruption, it can be restored in minutes.

2

Configuration

This chapter lists required hardware and software components and explains how to configure the disk array and Windows 2003 servers for use with HP Hardware Providers (HWP). You must complete the procedures in this chapter before you install HP HWP.

IMPORTANT NOTE: The right combination of software versions is crucial to configuring a working system. Refer to the README files accompanying the HP HWP installation files for information about compatible software versions and system configurations.

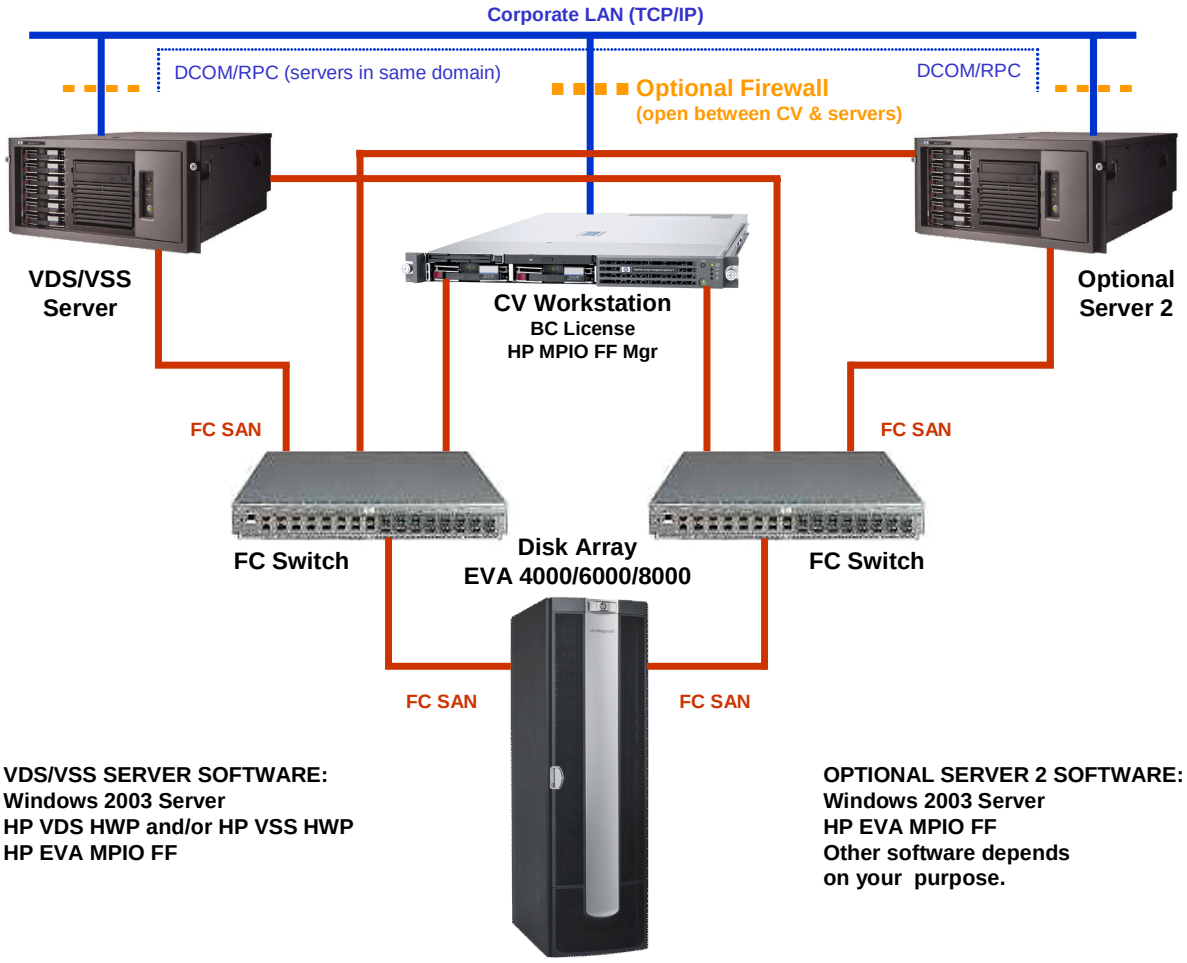
For HP Hardware Providers documentation and software downloads, see the following web location:

www.hp.com/support/vssvdshwp

Required components

The following illustration summarizes the hardware and software in a fully configured system. A second server is not needed for VDS and is optional for VSS, but it may be useful if you want to manage VSS data copies without burdening the primary server.

Note that any firewall must be open between the HWP server(s) and the Command View workstation. Anything that slows down access to the CV workstation will cause VSS timeout failures.



Required hardware components

- **HP StorageWorks Disk Array**: EVA disk array 4000/6000/8000 with a Windows workstation for running Command View EVA.
- **Windows VDS/VSS Server** with Windows Server 2003 OS for connecting to the array. This primary server manages your primary data and contains applications (such as Exchange or SQL), VSS/VDS, and HP HWP.
- **Windows Server 2 (optional)**—Another server ***may*** be connected to the array if you want to manage the VSS copies on the array volumes without burdening the VDS/VSS server. Depending on your purpose for this server, you may need to install the HP HWP and your application software.
- **Fibre Channel Host Bus Adapters (HBAs)** in each server for connecting to the disk array via a Fibre Channel SAN.
- **Fiber cables and fabric switch(es)** to connect the hosts to the array.
- **Ethernet Network Interface Cards** or available network interface port in each server for connecting to Ethernet LAN.
  Important: The Windows Network Connections control panel Advanced Settings must be set to list first the network that provides communication between the FRS servers and the CV workstation.

Required software components

The following software is required to run HP HWP.

IMPORTANT NOTE: The right combination of software versions is crucial to configuring a working system. Refer to the README files accompanying the HP HWP installation files for information about compatible software versions and system configurations. Follow all configuration and installation instructions carefully.

EVA 4000/6000/8000 Disk array with CV workstation:

- Command View EVA
- Business Copy EVA license (for VSS only; not required for VDS)
- HP MPIO Full-Featured Failover Manager (if multipathing is required)

VDS/VSS Server

- Windows Server 2003 Enterprise edition with SP1
- HP MPIO Full-Featured Failover (if multipathing is required)
- HP VDS HWP (for array management)
- HP VSS HWP (for shadow copying)

Secondary Server (optional)

- Windows Server 2003 Enterprise edition with SP1
- HP MPIO Full-Featured Failover (if multipathing is required)
- Other software as required depending on server purpose

Important configuration notes

The following notes will help ensure a successful configuration:

- Using multiple servers is optional. However, if you use multiple servers, they must be in the same Ethernet domain so that the DCOM communication process can communicate between servers.
- Administrator privileges are required for all devices and software. If you do not have administrator privileges, the software and hardware will not communicate properly.
- The firewall must be open between the CV workstation and the VDS/VSS servers.

Important performance notes

The following issues can affect the performance of HP HWP:

- Excessive traffic on the Ethernet LAN. If this becomes a problem, you may want to use a private Ethernet LAN between the CV workstation and the VDS/VSS server(s) and connect it to the corporate LAN through a firewall.
- Viruses that slow down network traffic. Be sure you regularly run a virus checker.
- A firewall that excessively slows traffic between the CV workstation and the servers hosting VDS/VSS. Any firewall must be open between these systems.

Configuration procedures

Physically configure the servers and software as described below and in the manuals for those products. See the overview diagram on page 24. Your HP representative may perform some installation and configuration tasks.

Configuration summary

You will perform the following tasks during configuration:

Windows CV workstation:

- Install HP MPIO FF Failover Manager (if multipathing is required).
- Use Command View EVA to activate the BC license.

VDS/VSS servers:

- Install Windows Enterprise OS with SP1, FC HBAs, drivers and software.
- Install HP MPIO Full-Featured Failover (if multipathing is desired).
- Connect to the array's FC SAN.
- Connect to the corporate Ethernet LAN (A firewall is optional but recommended. The firewall must be open between servers.)

Disk array (Command View EVA):

- (VSS only) Create a snapclone disk group (or use the existing production disk group).
- (VSS only) Create other disk groups as required by your application. (Exchange requires a data disk group and a log disk group.)

Configuring the array CV workstation

Configure the disk array Command View server as explained below. VDS only requires that you do step 1. All other steps support VSS:

1. If desired, connect the corporate Ethernet LAN to the CV workstation through a firewall. Make sure the firewall is open between the CV workstation and the VDS/VSS server(s).
2. If multipathing is desired, verify existing or install HP MPIO Full-Featured Failover Manager as explained in the documentation for that product.
3. Verify existing or add a license for Business Copy in Command View according to the instructions in the *Command View EVA Network Administration Guide*.

Configuring VDS/VSS Server

The VDS/VSS server contains the applications that create and store data. Install and configure the server as follows:

1. If it is not already present, install the Windows 2003 Enterprise Server OS on the host according to Microsoft's installation instructions.
2. If multipathing is desired, install the HP MPIO Full-Featured software according to the documentation for that product.
3. Install a Fibre Channel host bus adapter (HBA) card into the server according to the HBA manufacturer's instructions.
4. Install the HBA driver and utility software onto the server according to the HBA manufacturer's instructions. HP tested drivers are available by searching hp.com; follow the README file for installation.
5. Connect the server to the disk array through a fabric switch and SAN topology configured according to the manufacturer's instructions.
6. Connect the server to the corporate Ethernet LAN, through a firewall if desired. Be sure the firewall is open between the CV and VDS/VSS server(s). Use a **`ping`** command to test communication between servers. The Hardware Providers use ports 12301 and 2301; these ports must be available in order for HWP to function.
7. Complete configuration in this chapter and then install the required HP HWP software on the server as explained in Chapter 3 "Installation."

Configuring additional servers

An additional server for managing data copies is optional, and its configuration depends on your specific application. If you plan to use additional servers, configure them according to the preceding instructions.

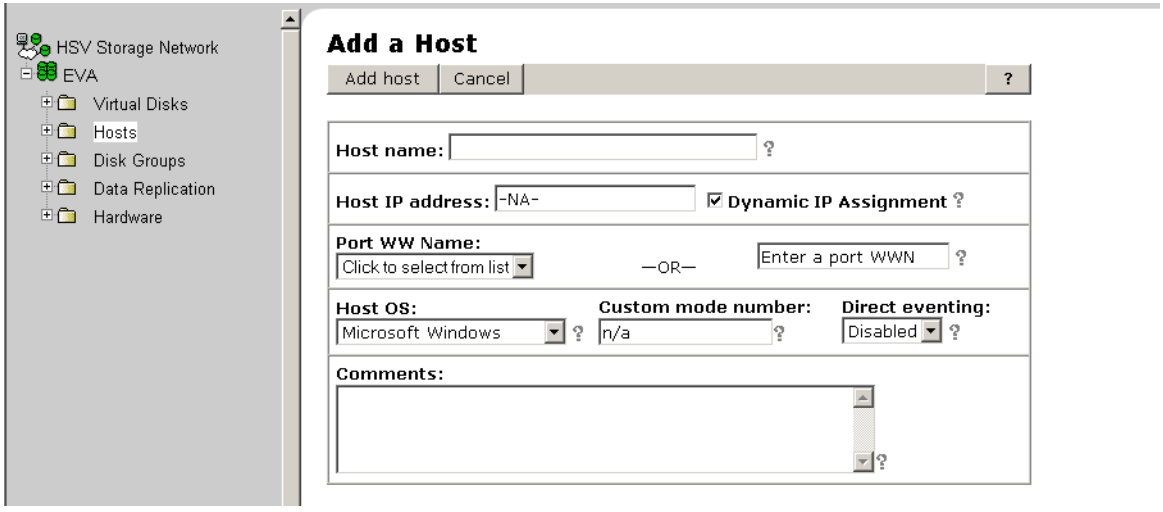
Configuring the EVA 4000/6000/8000 disk array

The following configuration steps are required only if you will use VSS to make volume shadow copies. If you are only using VDS and will not use VSS, you can skip these configuration steps.

1. Log into Command View as an administrator (the default administrator user name and password is **administrator)**.

Adding VDS/VSS hosts

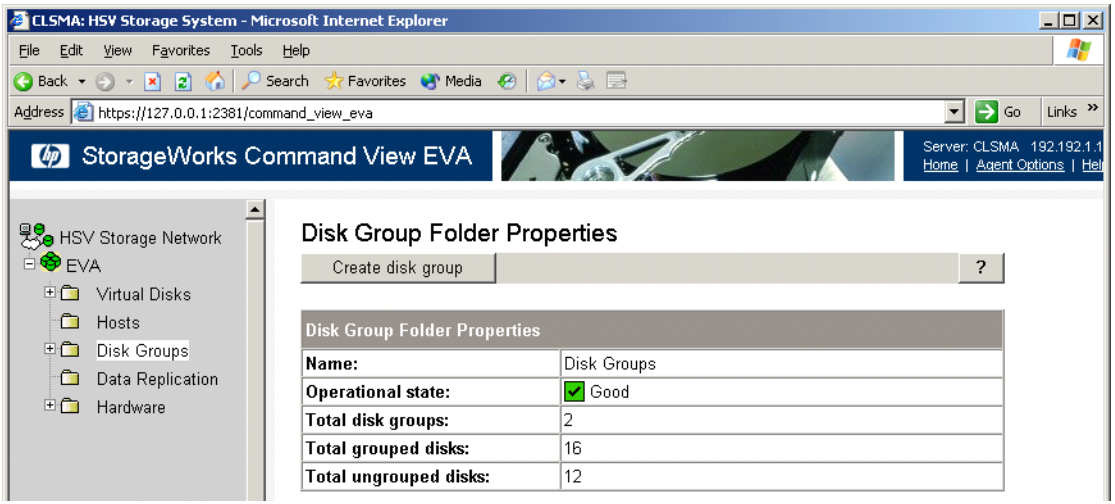
2. Click the + symbol next to the EVA disk array in the left panel to expand the contents of the array and begin configuration.
3. Click the **Hosts** folder in the left panel. The Host Folder Properties window displays. Click **Add Host** and fill in the host characteristics for the VDS/VSS server. Click **Save Changes** to save the new host information. Repeat if you are adding a second server.



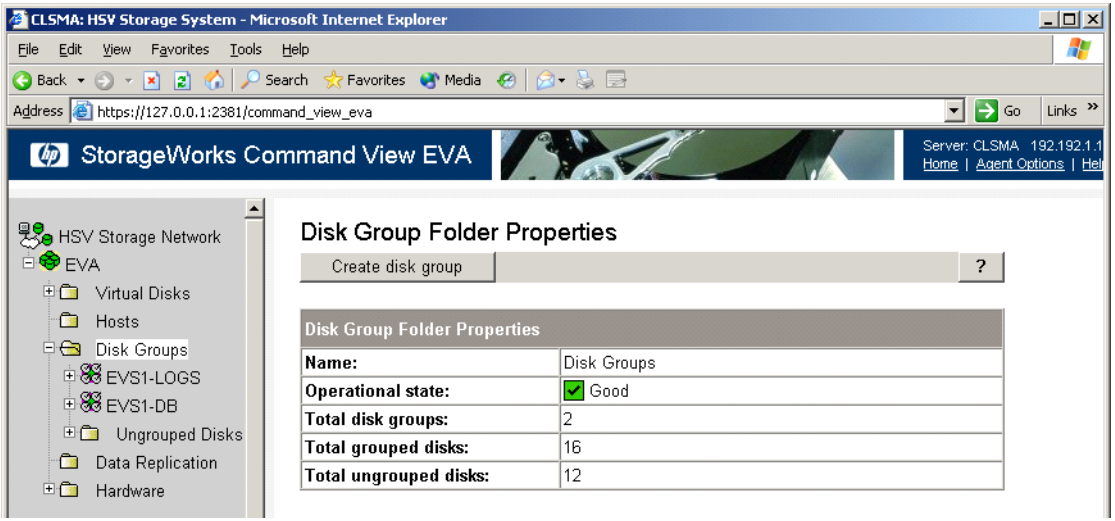
Adding disk groups

Add a snapclone disk group using the steps below. Some applications, such as Exchange or SQL, may also require disk groups for data and logs.

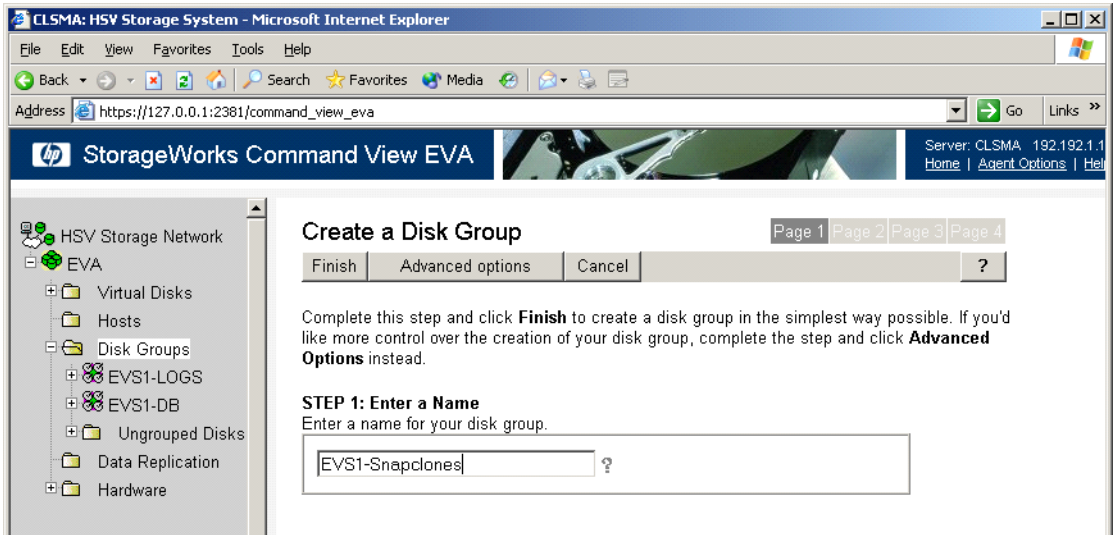
4. Click the **Disk Groups** folder in the left panel. The Disk Groups Properties window displays.



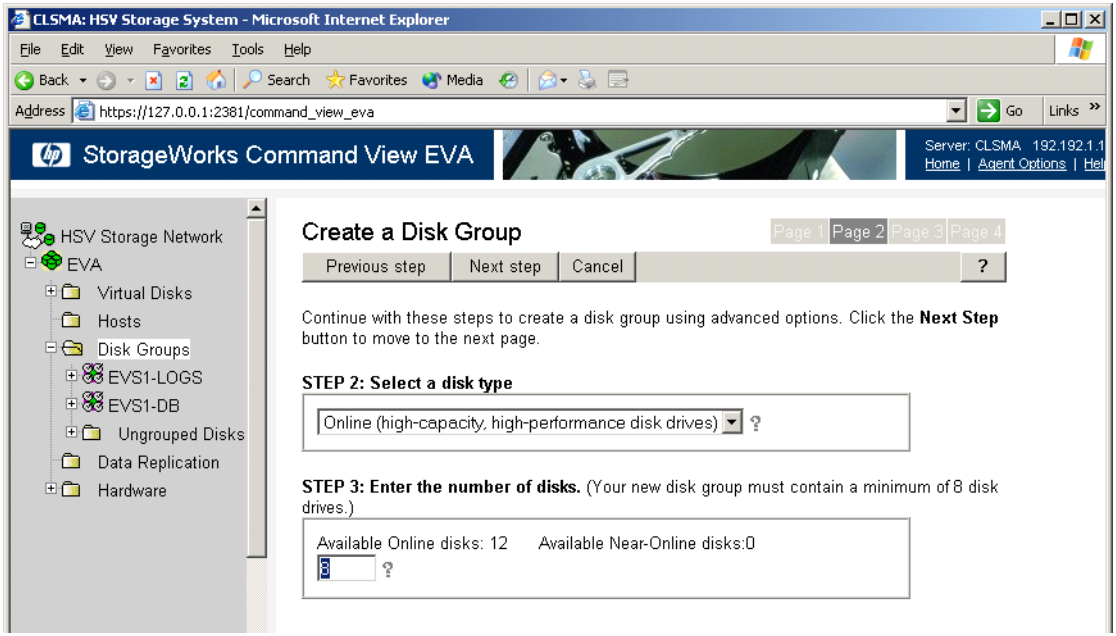
5. Select the + next to the Disk Groups folder to expand Disk Groups.



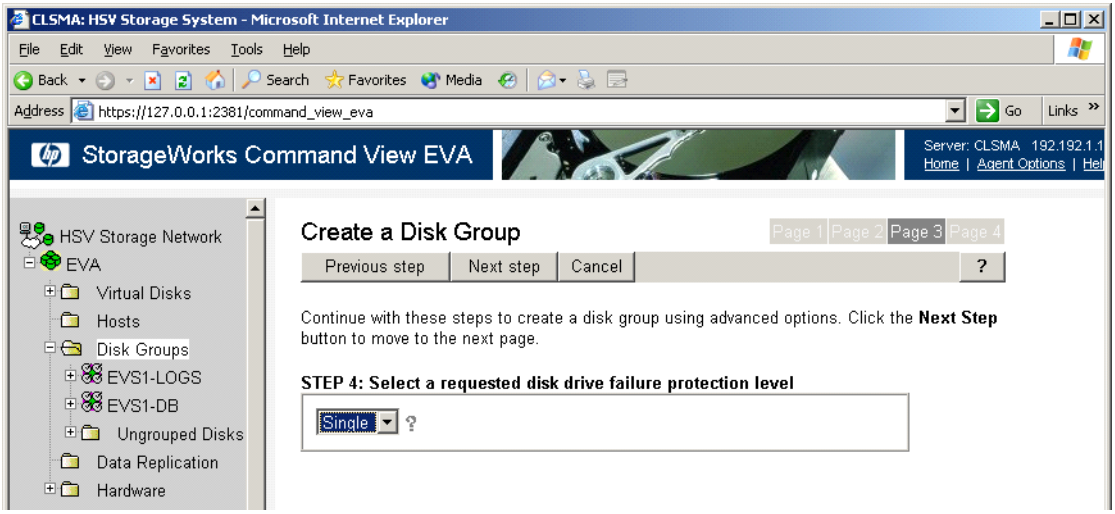
6. Click **Create disk group** to begin creating a new disk group.



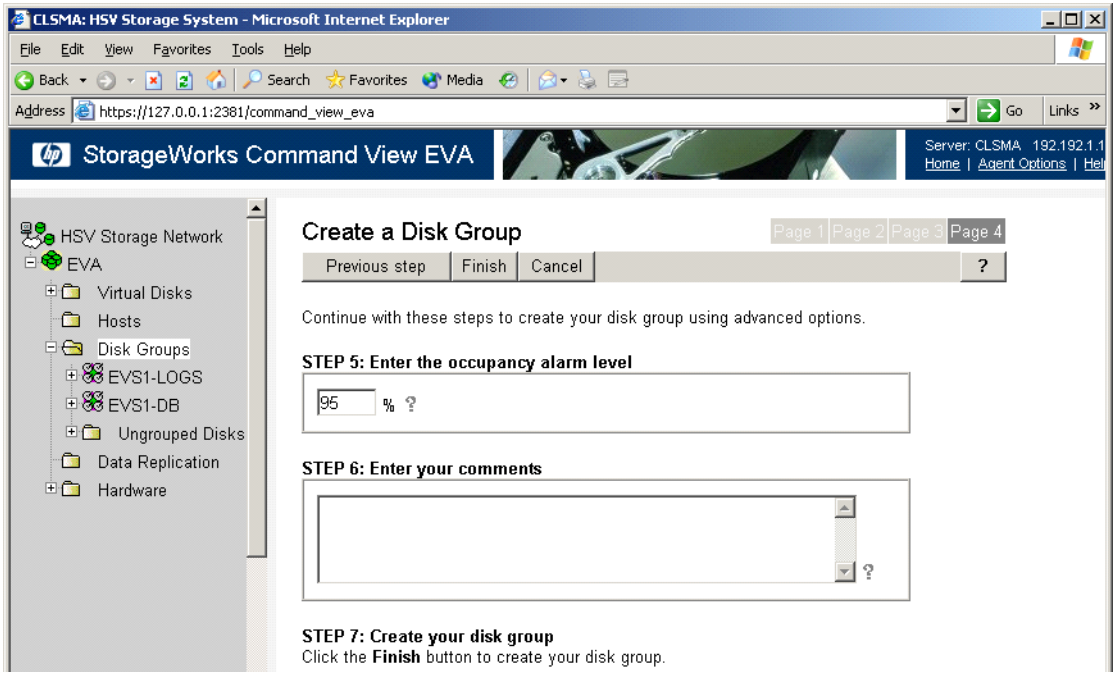
7. Enter a name for the new disk group, and click Advanced options.



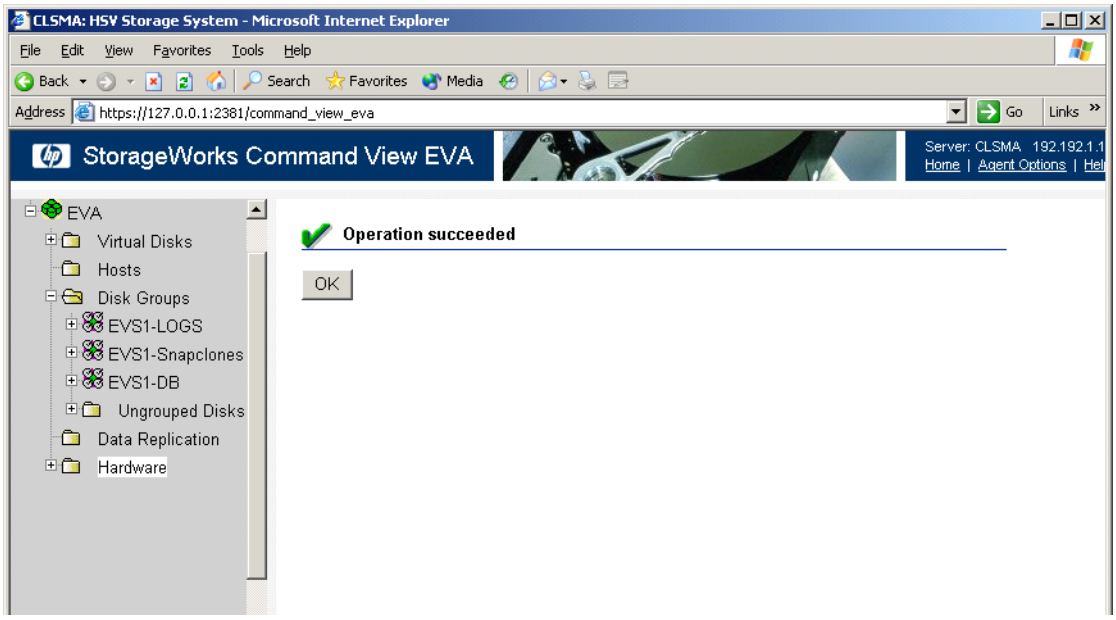
8. Select a disk type, enter the number of disks to use for this disk group, and click **Next step**.



9. Select a drive failure protection level, and click **Next step**.



10. Accept the occupancy alarm level and select **Finish**.



11. A message indicates the disk group was added, and the new group appears in the left panel. Click **OK**.
12. Repeat the previous steps as required to add the disk groups needed for your application.

3

Installation

This chapter explains how to install Hardware Providers (HWP) and other required software. When you install HWP, all the features of VDS and VSS are enabled, including point-in-time copies of LUNs and storage virtualization management.

If you have not already configured the server and the array as instructed in Chapter 2 “Configuration,” do so now before you install the HWP software. **HWP will not work if the array and server have not been correctly configured before you install HWP**.

IMPORTANT NOTE: The right combination of software versions is crucial to configuring a working system. Refer to the README files accompanying the HP HWP installation files for information about compatible software versions and system configurations.

For HP Hardware Providers software downloads and documentation, see the following web location:

www.hp.com/go/storageworks/vds-vss

Installation procedures

The following procedures describe how to install the Hardware Providers.

If you have not already configured the server and the array as instructed in Chapter 2 "Configuration," do so now before you install the HWP software. HWP will not work if the array and server have not been correctly configured before you install HWP. For a summary of the configuration steps, see "Configuration summary" on page 28.

Installation summary

You will perform the following tasks during installation:

- Run the HWP installation executable(s):
  hp StorageWorks VDS hardware provider for EVA.msi
  and/or
  hp StorageWorks VSS hardware provider for EVA.msi.
- Follow the InstallShield Wizard instructions to do the following tasks.
- Accept the license terms.
- Install the HP HWPs in the default or custom folder location.
- Enter the CV workstation IP address and log into Command View EVA.
- Connect to the disk array.
- Select the disk group you created for VSS copies.

Installing HWP

Installation for VDS and VSS is nearly identical; therefore only VSS installation is described. However, each package must be installed individually. Install VDS first to provide disk management capability. If you also want to make data copies, install VSS second.

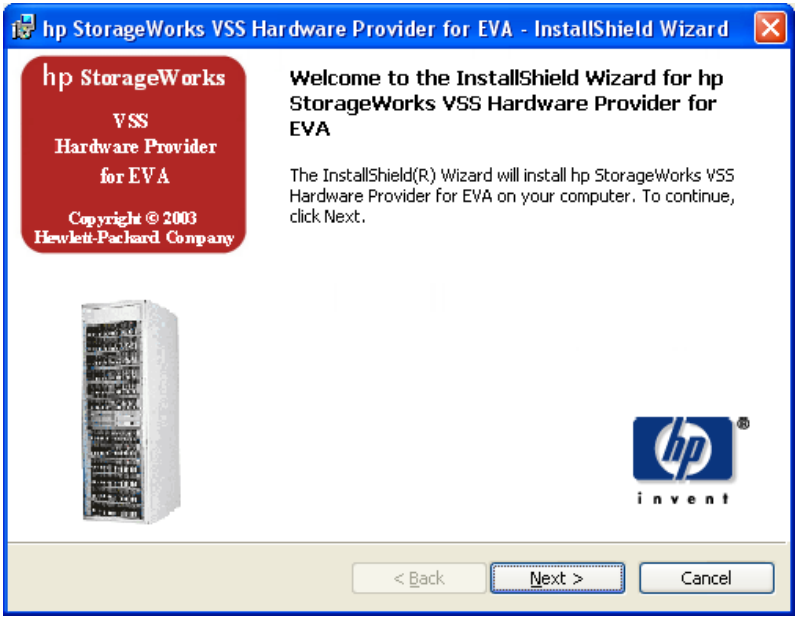
1. Before you start installation, use a **`ping`** command to test communication with the Command View EVA server.
2. Download and extract the HWP files from the HP VSS/VDS web page: www.hp.com/go/storageworks/vds-vss.
3. Double click the HWP executable:

   hp StorageWorks VDS hardware provider for EVA.msi

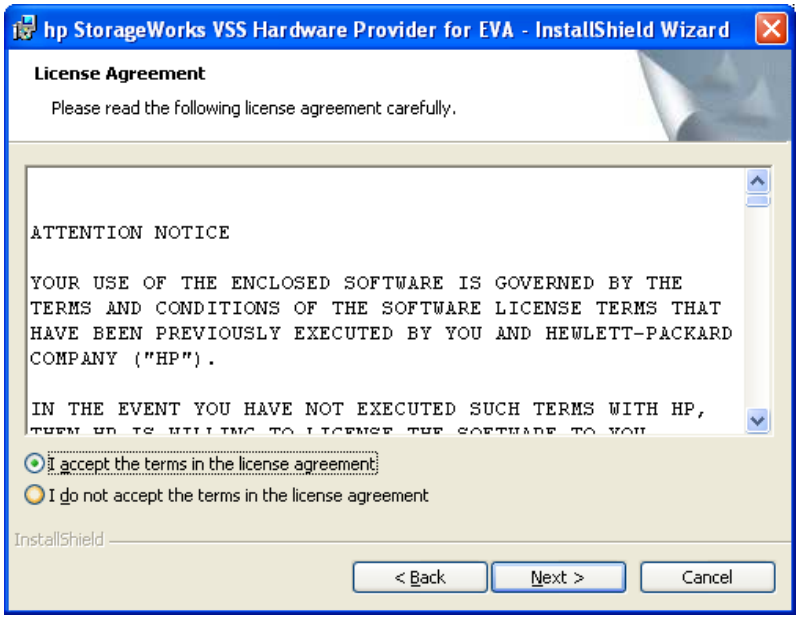
   or

   hp StorageWorks VSS hardware provider for EVA.msi

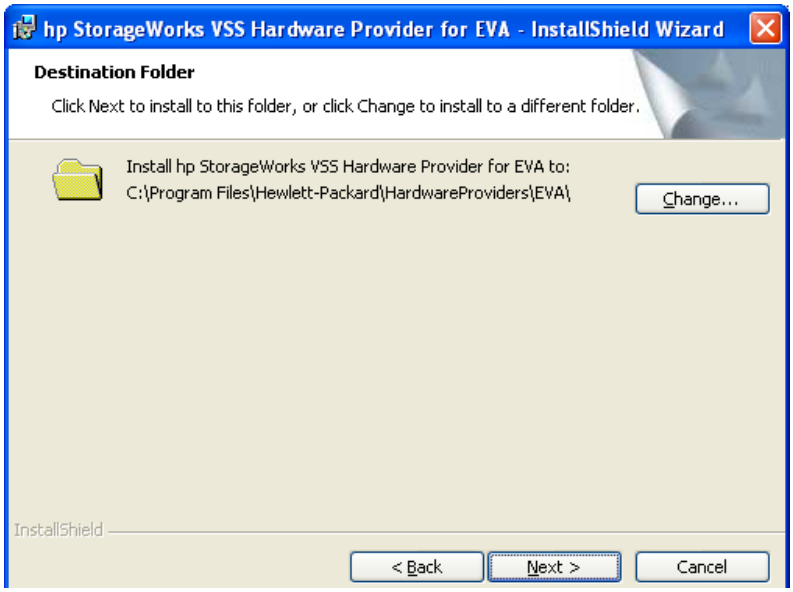
   The InstallShield Welcome window appears.



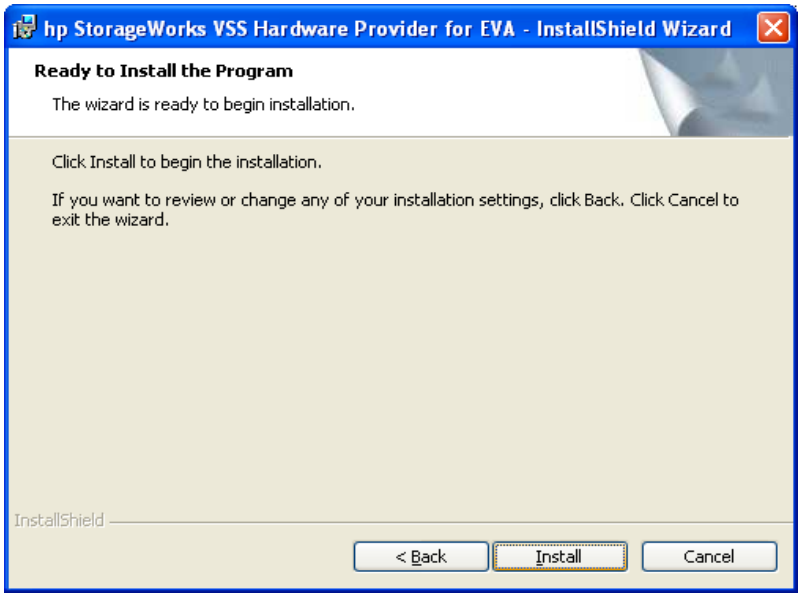
4. Click **Next**. The License Agreement window appears.



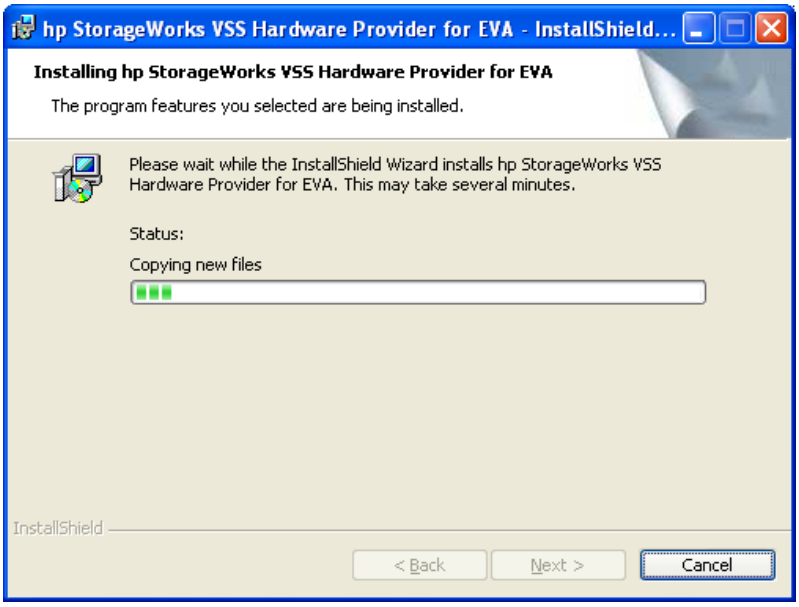
5. Click **"I accept..."** to agree to the license terms, and click **Next**. The Destination Folder window appears.



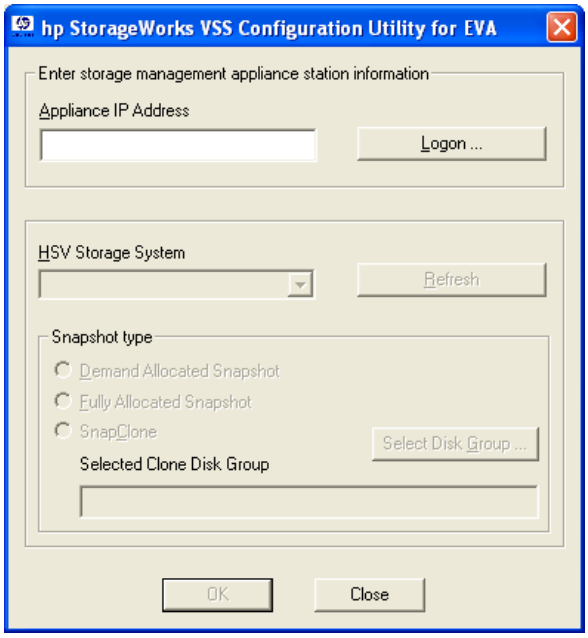
6. Click **Next** to install VDS or VSS in the default location, or click **Change** to browse for a new location, and then click **Next**. The Ready to Install window appears.



7. Click **Install** to start the installation. A status window shows progress.



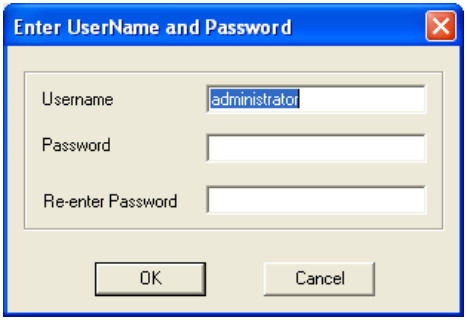
8. When installation finishes, the VSS-VDS Configuration Utility opens.



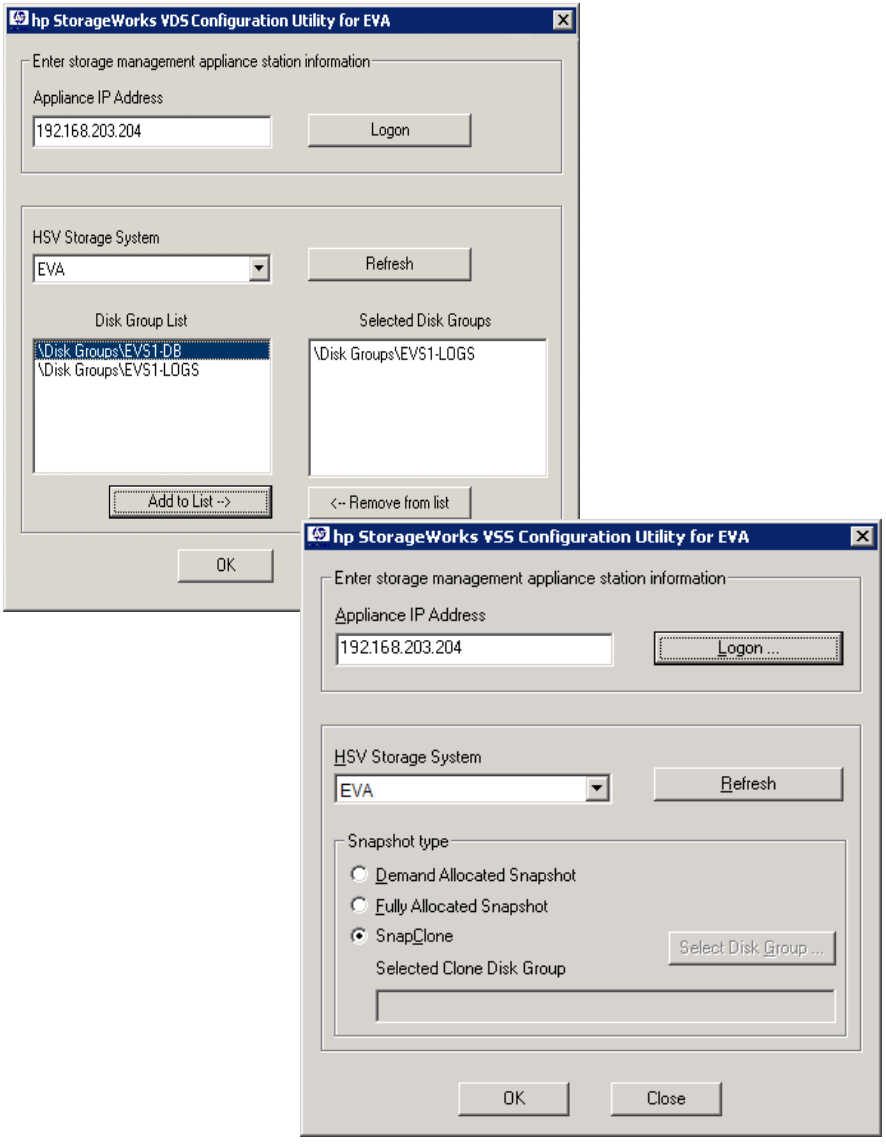
Configuring VSS/VDS to access Command View:

9. In the Appliance IP Address text box, enter the IP address of the server where Command View is installed and click **Logon**.

   The Enter UserName and Password window pops up.



10. Enter the administrator's User Name and Password to the Command View system. (The default username and password is "administrator".) Click **OK**. A "loading..." message appears while the system authenticates the logon. The system populates the Configuration Utility window HSV Storage System box with the name of the disk array and (VDS) a list of available disk groups.



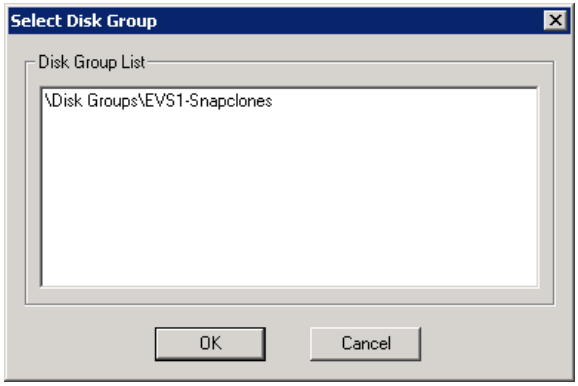
If the name of the array does not appear, the logon is incorrect or a communication problem has occurred with the CV workstation. Check your logon and password and check connectivity (for example, a firewall may be interfering with communication).

Selecting the disk group:

11. For VDS, click on a disk group in the Disk Group List, and click **Add to List** to add the group to the list of Selected Disk Groups available to VDS HWP. Then click **OK**.

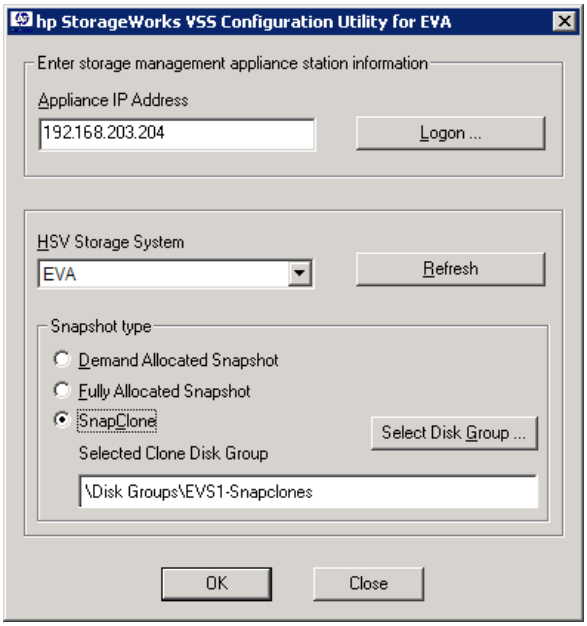
    For VSS, click **Snapclone** and click **Select Disk Group** to open the list of disk groups (below). Select the disk group you created for VSS copies and click **OK**.

    If no disk groups are listed, make sure you created the disk groups and presented them to the server during configuration.



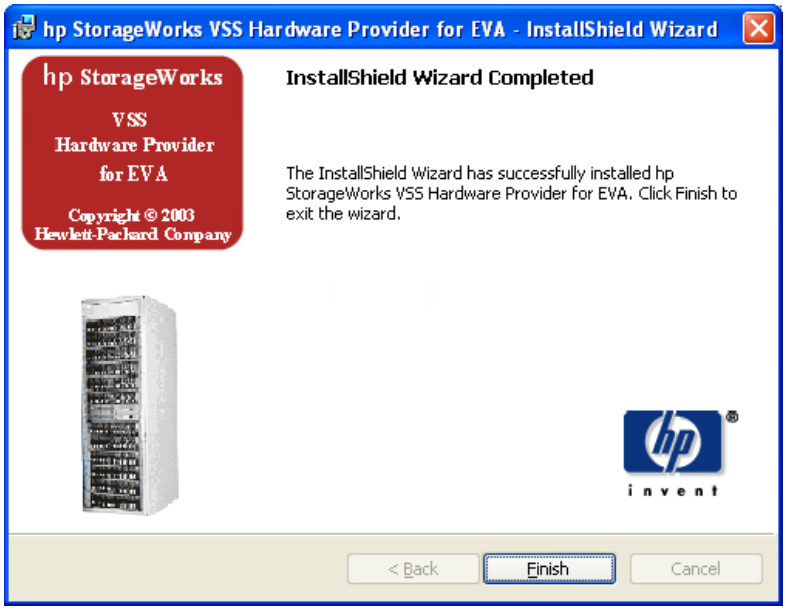
    For VDS, when you click OK, the Configuration Utility window closes.

    For VSS, the Configuration Utility window appears as shown below.



12. For VSS, check that the disk group you selected is displayed. Then click **OK**.

The InstallShield Wizard Completed window appears.



13. Click **Finish**. HWP installation is complete.

Verifying installation

To verify installation, perform the following tests. If you have any trouble with installation or with verifying installation, see Chapter 4 “Troubleshooting” in this guide.

Checking the list of programs

A simple way to verify successful installation of the HP HWPs is to make sure they are listed in the Add/Remove Programs Control Panel in Windows. To see the list of installed programs, click Windows **Start**, click **Settings**, click **Control Panel**, and double-click **Add/Remove Programs**.

You can also check that the hpEVA VSS Hardware Provider is running by making sure it is listed when you type the following at the command line:

vssadm list providers

Checking VDS disk management using DiskRaid

You can install and run the Microsoft DiskRaid command line interface and use the “list provider” and “list subsystem” commands to verify the HP HWP is working properly. DiskRaid comes with the Windows 2003 Resource Kit and requires the HP VDS HWP in order to work with the HP disk array. The example output below shows the use of these commands:

```
DISKRAID> List Provider

  Prov ###  Name                                          Version
  --------  --------------------------------------------  ----------
* Prov 0    hpEVA VDS Hardware Provider                  2.7.2.0

DISKRAID> list subsystem

  Subsys ###  Name                            Status      Health
  ----------  ------------------------------  ----------  ----------
  Subsys 0    HP EVA    (SN# 12345)           Online      Healthy
```

Checking VSS volume shadow copying

Testing the HP VSS HWP requires a third party application that can work with VSS, the HP VSS HWP, and the disk array to create hardware volume shadow copies. One such program is Microsoft's **vshadow** utility, which comes with the VSS Software Developer's Kit.

Test the HWP installation by making a shadow copy of the array volumes containing production data. Then check whether a copy of the production data appears on the snapclone volumes of the array. If the copy is not successful, see Chapter 4 "Troubleshooting."

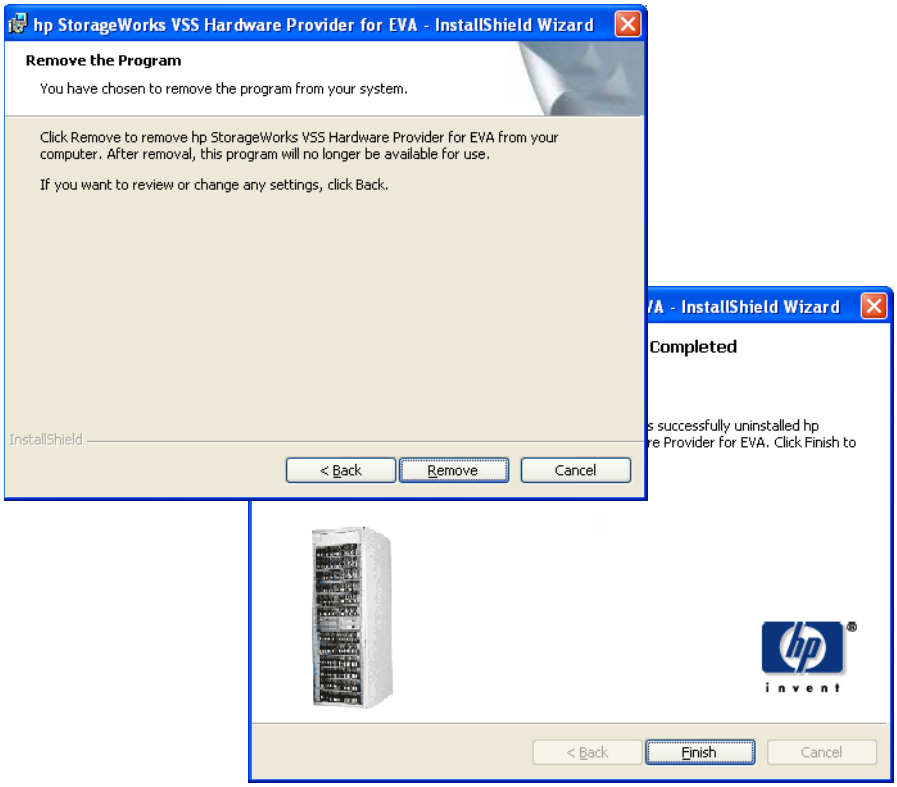
Uninstalling HWP

Uninstalling HWP using Windows

1. In Windows, select **Start > Settings > Control Panel**.
2. Double-click **Add/Remove Programs**.
3. Select the program you want to remove (VDS or VSS).
4. Click **Change/Remove**. Windows removes the program.

Uninstalling using HWP Installer

You can also uninstall HP HWP by starting the HP HWP installer again. Click Next to open the Remove window. Click **Remove,** then click **Finish**.



4

Troubleshooting

This chapter explains how to troubleshoot Hardware Providers (HWP) and also presents a list of VDS and VSS error messages and explanations.

Troubleshooting

The following instructions present typical problems and solutions.

VDS/VSS HWP will not install

The HP HWP installation works only on the Windows versions listed in the Configuration chapter of this guide and in the README file supplied with the HP HWP. The installer will not install the software on other versions of Windows.

VDS disk array management not working

Use a process of elimination to determine whether the problem is with one of the following components:

- Application managing the array
- VDS
- HP HWP
- EVA disk array

Perform these tests:

1. Do the array volumes appear in the Disk Management tool? To check, in the Windows menu bar select **Start > Control Panels > Administrative Tools > Computer Management > Storage > Disk Management**. If array LUNs are not visible, click **Action > Refresh** and **Action > Scan Disks**.
2. Do the array volumes appear when you use the DiskPart utility? At the Run command line, type **diskpart.exe**. Type **list disk** to see a list of disk devices present. (Type "help" to see a list of commands.)

   If you receive this error message: "**The disk management services could not complete the operation**," VDS is not enabled at startup. Click **Start > Control Panels > Administrative Tools > Services >** right-click **Virtual Disk Service > Properties >** click **Manual** under **Startup type** and click **OK**.

3. Check the README file that came with your HP HWP installation files to verify you are using compatible versions of software.
4. Make sure you configured the VDS/VSS Configuration Utility as explained in Chapter 3 Installation.
5. Check configuration as explained in Chapter 2 Configuration:

   (A) Check LAN connectivity between all servers and the array.

   (B) Make sure the firewall is open between all servers and the array.

   (C) Check Command View server NIC bindings: the LAN that connects to the VDS/VSS server must be listed first.

   (D) Make sure you logged into all devices and software using administrator privileges.
6. Visit the Microsoft website support knowledge base and search for "VDS logging." Turn on logging as instructed by Microsoft and use the Microsoft procedure for testing VDS and checking the log.

VSS volume copying not working

1. Is the VSS HWP running? At the command prompt, type:

   vssadm list providers

   You should see the hpEVA VSS hardware provider listed.

2. Verify that the Business Copy license is installed. A BC license is required in order to produce data copies using VSS.

3. Make sure you configured the VDS/VSS Utility as explained in Chapter 3 Installation.

4. Check configuration as explained in Chapter 2 Configuration:

   (A) Check CV workstation and VDS/VSS server connectivity.

   (B) VDS/VSS server not connected to the SAN correctly.

   (C) A firewall may be interfering with connectivity between servers.

5. Review the Windows application event log, Windows system event log, and VSS trace to locate errors in the snapshot process. See the Microsoft website and Windows help for information about the log and trace files.

6. Use a process of elimination to determine which components are not working. You can do this by testing components individually:

   - Test VSS and the array by using the Microsoft **vshadow** utility available in the Microsoft VSS Software Developer's Kit to create snapshots. At the command line, type:

     vshadow [drive letter]

     The drive letter is the production LUN you want to copy. See the Microsoft documentation for details about using vshadow.

   - Test your backup application and VSS together by making a backup copy on a local drive, bypassing HWP and the disk array.

VSS copies intermittently fail or time out

VSS allows only 30 seconds for the entire snapshot process, including only 10 seconds for actually making the copy. This narrow time window can cause any limitation in your system to hamper successful snapshots. The following issues may affect system performance:

- Firewall or LAN traffic slowing or preventing communication. Reconfigure the firewall or LAN to increase throughput.
- Viruses slowing server operation. Check for and clean off viruses.
- VDS/VSS server is too slow. Use a fast, late mode CPU with sufficient memory.
- Inadequate privileges. Administrator privileges are required in all applications and on all hardware used with HP VSS HWP.
- Writer application not configured according to best practices. Consult the software manufacturer for recommended practices. For example, keeping database files small by creating more rather than larger files may speed up overall operation and database copying. Saving transaction logs to a different volume than the database may also speed up performance.
- Review the Windows application event log, Windows system event log, and VSS trace to locate errors in the snapshot process. See the Microsoft website and Windows help for information about the log and trace files.

Error messages

The following tables list error messages and their meanings.

VDS error messages

Message Id	MessageID Value (hex)	Message Text
VDS_E_NOT_SUPPORTED	0x80042400L	The operation is not supported by the object.
VDS_E_INITIALIZED_FAILED	0x80042401L	The service failed to initialize.
VDS_E_INITIALIZE_NOT_CALLED	0x80042402L	The initialization method is not called.
VDS_E_ALREADY_REGISTERED	0x80042403L	The provider is already registered.
VDS_E_ANOTHER_CALL_IN_PROGRESS	0x80042404L	A concurrent second call is made on an object before the first is completed.
VDS_E_OBJECT_NOT_FOUND	0x80042405L	The object is not found.
VDS_E_INVALID_SPACE	0x80042406L	The specified space is not free or not valid.
VDS_E_PARTITION_LIMIT_REACHED	0x80042407L	Number of partitions has reached the limit on a disk.
VDS_E_PARTITION_NOT_EMPTY	0x80042408L	The extended partition is not empty.
VDS_E_OPERATION_PENDING	0x80042409L	The operation has not been completed yet.
VDS_E_OPERATION_DENIED	0x8004240AL	This operation is not allowed on the current boot, system or page file volume.
VDS_E_OBJECT_DELETED	0x8004240BL	The object has been deleted.
VDS_E_CANCEL_TOO_LATE	0x8004240CL	The operation cannot be cancelled because it is too late.
VDS_E_OPERATION_CANCELED	0x8004240DL	The operation has been cancelled.
VDS_E_CANNOT_EXTEND	0x8004240EL	The volume cannot be extended because the file system does not support it.
VDS_E_NOT_ENOUGH_SPACE	0x8004240FL	There is not enough usable space for this operation.

VDS_E_NOT_ENOUGH_DRIVE	0x80042410L	Not enough drives are specified to complete this operation.
VDS_E_BAD_COOKIE	0x80042411L	The cookie is not found.
VDS_E_NO_MEDIA	0x80042412L	There is no media in the device.
VDS_E_DEVICE_IN_USE	0x80042413L	The device is in use.
VDS_E_DISK_NOT_EMPTY	0x80042414L	The disk is not empty.
VDS_E_INVALID_OPERATION	0x80042415L	Invalid operation.
VDS_E_PATH_NOT_FOUND	0x80042416L	The path is not found.
VDS_E_DISK_NOT_INITIALIZED	0x80042417L	The disk is not initialized.
VDS_E_NOT_AN_UNALLOCATED_DISK	0x80042418L	The disk is not unallocated.
VDS_E_UNRECOVERABLE_ERROR	0x80042419L	Unrecoverable error happened. The service must shut down.
VDS_S_DISK_PARTIALLY_CLEANED	0x0004241AL	The disk is not fully cleaned due to I/O error.
VDS_E_DMADMIN_SERVICE_ CONNECTION_FAILED	0x8004241BL	The provider failed to connect to the Logical Disk Management Administrative service.
VDS_E_PROVIDER_INITIALIZATION_ FAILED	0x8004241CL	The provider failed to initialize.
VDS_E_OBJECT_EXISTS	0x8004241DL	The object already exists.
VDS_E_NO_DISKS_FOUND	0x8004241EL	No disks were found on the target machine.
VDS_E_PROVIDER_CACHE_CORRUPT	0x8004241FL	The provider's cache has become corrupt.
VDS_E_DMADMIN_METHOD_CALL_FAILED	0x80042420L	A method call to the Logical Disk Management Administrative service failed.
VDS_S_PROVIDER_ERROR_LOADING_CACHE	0x00042421L	The provider encountered errors while loading the cache. See the NT Event Log for more information.
VDS_E_PROVIDER_VOL_DEVICE_NAME_NOT_ FOUND	0x80042422L	The device form of the volume pathname could not be retrieved.
VDS_E_PROVIDER_VOL_OPEN	0x80042423L	Failed to open the volume device.
VDS_E_DMADMIN_CORRUPT_NOTIFICATION	0x80042424L	A corrupt notification was sent from the Logical Disk Manager Administrative service.
VDS_E_INCOMPATIBLE_FILE_SYSTEM	0x80042425L	The file system is incompatible.

VDS_E_INCOMPATIBLE_MEDIA	0x80042426L	The media is incompatible.
VDS_E_ACCESS_DENIED	0x80042427L	Access is denied.
VDS_E_MEDIA_WRITE_PROTECTED	0x80042428L	The media is write protected.
HRESULT VDS_E_BAD_LABEL	0x80042429L	The label is illegal.
VDS_E_CANT_QUICK_FORMAT	0x8004242AL	Can not quick format the volume.
VDS_E_IO_ERROR	0x8004242BL	IO error occurred during format.
VDS_E_VOLUME_TOO_SMALL	0x8004242CL	The volume size is too small.
VDS_E_VOLUME_TOO_BIG	0x8004242DL	The volume size is too big.
VDS_E_CLUSTER_SIZE_TOO_SMALL	0x8004242EL	The cluster size is too small.
VDS_E_CLUSTER_SIZE_TOO_BIG	0x8004242FL	The cluster size is too big.
VDS_E_CLUSTER_COUNT_BEYOND_32BITS	0x80042430L	The number of clusters is too big for 32 bit integer.
VDS_E_OBJECT_STATUS_	0x80042431L	The object is in failed status.
VDS_E_VOLUME_INCOMPLETE	0x80042432L	All extents for the volume could not be found.
VDS_E_EXTENT_SIZE_LESS_THAN_MIN	0x80042433L	The size of the extent is less than the minimum.
VDS_S_UPDATE_BOOTFILE_FAILED	0x00042434L	Failed to update the boot.ini file or NVRAM.
VDS_S_BOOT_PARTITION_NUMBER_CHANGE	0x00042436L	The boot partition's partition number will change as a result of the migration operation.
VDS_E_BOOT_PARTITION_NUMBER_CHANGE	0x80042436L	The migration operation failed. The boot partition's partition number will change as a result of the migration operation.
VDS_E_NO_FREE_SPACE	0x80042437L	The migration operation failed. The selected disk does not have enough free space to complete the operation.
VDS_E_ACTIVE_PARTITION	0x80042438L	The migration operation failed. An active partition was detected on the selected disk, and it is not the active partition used to boot the currently running OS.
VDS_E_PARTITION_OF_UNKNOWN_TYPE	0x80042439L	The migration operation failed. Cannot read partition information.

VDS_E_LEGACY_VOLUME_FORMAT	0x8004243AL	The migration operation failed. A partition with an unknown type was detected on the selected disk.
VDS_E_NON_CONTIGUOUS_DATA_ PARTITIONS	0x8004243BL	The migration operation failed. The selected GPT formatted disk contains a non-basic-data partition, which is both preceded, and followed, by a basic data partition(s).
VDS_E_MIGRATE_OPEN_VOLUME	0x8004243CL	The migration operation failed. A volume on the selected disk could not be opened.
VDS_E_VOLUME_NOT_ONLINE	0x8004243DL	Operation failed. The volume is not online
VDS_E_VOLUME_NOT_HEALTHY	0x8004243EL	Operation failed. The volume is not healthy.
VDS_E_VOLUME_SPANS_DISKS	0x8004243FL	Operation failed. The volume spans multiple disks.
VDS_E_REQUIRES_CONTIGUOUS_DISK_SPACE	0x80042440L	Operation failed. The volume consists of multiple extents.
VDS_E_BAD_PROVIDER_DATA	0x80042441L	A provider returned bad data.
VDS_E_PROVIDER_FAILURE	0x80042442L	A provider failed to complete an operation.
VDS_S_VOLUME_COMPRESS_FAILED	0x00042443L	Failed to compress the volume.
VDS_E_PACK_OFFLINE	0x80042444L	The operation failed. The pack is not online.
VDS_E_VOLUME_NOT_A_MIRROR	0x80042445L	Break or remove plex operation failed. The volume is not a mirror.
VDS_E_NO_EXTENTS_FOR_VOLUME	0x80042446L	No extents were found for the volume.
VDS_E_DISK_NOT_LOADED_TO_CACHE	0x80042447L	The migrated disk failed to load to the cache.
VDS_E_INTERNAL_ERROR	0x80042448L	Check the event log for errors.
VDS_S_ACCESS_PATH_NOT_DELETED	0x000042449L	The access paths on the volume may not be deleted.
VDS_E_PROVIDER_TYPE_NOT_SUPPORTED	0x8004244AL	The method call is not supported for the specified provider type.
VDS_E_DISK_NOT_ONLINE	0x8004244BL	The repair operation failed. The disk is already in use by the volume.
VDS_S_IN_PROGRESS	0x0004244DL	The asynchronous operation is in progress.
VDS_E_ASYNC_OBJECT_FAILURE	0x8004244EL	Failure initializing the asynchronous object.

VDS_E_VOLUME_NOT_MOUNTED	0x8004244FL	The volume is not mounted.
VDS_E_PACK_NOT_FOUND	0x80042450L	The pack was not found.
VDS_E_IMPORT_SET_INCOMPLETE	0x80042451L	Import failed. Attempt to import a subset of the disks in the foreign pack.
VDS_E_DISK_NOT_IMPORTED	0x80042452L	A disk in the import's source pack was not imported.
VDS_E_OBJECT_OUT_OF_SYNC	0x80042453L	The system's information about the object may not be up to date.
VDS_E_MISSING_	0x80042454L	Operation failed. The disk is missing.
VDS_E_DISK_PNP_REG_CORRUPT	0x80042455L	The provider's list of Pnp registered disks has become corrupt.
VDS_E_LBN_REMAP_ENABLED_FLAG	0x80042456L	The provider does not support the LBN REMAP ENABLED volume flag.
VDS_E_NO_DRIVELETTER_FLAG	0x80042457L	The provider does not support the NO DRIVELETTER volume flag.
VDS_E_REVERT_ON_CLOSE	0x80042458L	REVERT ON CLOSE should only be set if the HIDDEN or READ ONLY volume flag is set.
VDS_E_REVERT_ON_CLOSE_SET	0x80042459L	A REVERT ON CLOSE volume flag is already set for this volume.
VDS_E_REVERT_ON_CLOSE_MISMATCH	0x80042459L	When clearing volume flags that have been set using revert on close, the same combination of HIDDEN and/or READ ONLY flags must be passed to both the SetFlags and ClearFlags calls.
VDS_E_IA64_BOOT_MIRRORED_TO_MBR	0x8004245AL	Not Used! You have mirrored your boot volume on a GPT disk, to an MBR disk. You will not be able to boot your machine from the secondary plex.
VDS_S_IA64_BOOT_MIRRORED_TO_MBR	0x0004245AL	You have mirrored your boot volume on a GPT disk, to an MBR disk. You will not be able to boot your machine from the secondary plex.
VDS_S_UNABLE_TO_GET_GPT_ATTRIBUTES	0x0004245BL	Unable to retrieve the GPT attributes for this volume, (hidden, read only and no drive letter).

VDS_E_VOLUME_TEMPORARILY_ DISMOUNTED	0x8004245CL	The volume is temporarily dismounted.
VDS_E_VOLUME_PERMANENTLY_ DISMOUNTED	0x8004245DL	The volume is permanently dismounted.
VDS_E_VOLUME_HAS_PATH	0x8004245EL	The volume still has access path to it.
VDS_E_TIMEOUT	0x8004245FL	The operation timed out.
VDS_E_REPAIR_VOLUMESTATE	0x80042460L	The operation could not be completed. To repair a volume, both the volume and plex must be online, and must not be healthy or rebuilding.
VDS_E_LDM_TIMEOUT	0x80042461L	The operation timed out in the Logical Disk Manager Administrative service. Retry the operation.
VDS_E_PLEX_NOT_REGENERATED	0x80042462L	The operation failed. Cannot retain plex that has not regenerated.
VDS_E_RETRY	0x80042463L	The operation failed. Retry the operation.
VDS_E_ONLINE_PACK_EXISTS	0x80042464L	Create pack operation failed. An online pack already exists.

VSS error messages

Error	Meaning	Corrective Action
VSS_E_BAD_STATE	0x80042301L	A function call was invalid because of the state of either the backup extensions or the coordinator. For example calling AddToSnapshot set prior to calling StartSnapshotSet.
VSS_E_PROVIDER_ALREADY_REGISTERED	0x80042303L	Calling RegisterProvider.
VSS_E_PROVIDER_NOT_REGISTERED	0x80042304L	Calling UnregisterProvider.
VSS_E_PROVIDER_VETO	0x80042306L	Calling DoSnapshotSet.
VSS_E_PROVIDER_IN_USE	0x80042307L	Calling UnregisterProvider, StartSnapshotSet.
VSS_E_OBJECT_NOT_FOUND	0x80042308L	Calling DeleteSnapshots, Query.
VSS_S_ASYNC_PENDING	0x00042309L	Calling IVssAsync:: QueryStatus.
VSS_S_ASYNC_FINISHED	0x0004230AL	Calling IVssAsync::QueryStatus.
VSS_S_ASYNC_CANCELLED	0x0004230BL	Calling IVssAsync::QueryStatus.
VSS_E_VOLUME_NOT_SUPPORTED	0x8004230CL	Calling AddToSnapshotSet.
VSS_E_OBJECT_ALREADY_EXISTS	0x8004230DL	Calling ExposeCurrentState.
VSS_E_VOLUME_NOT_SUPPORTED_ BY_PROVIDER	0x8004230EL	Calling AddToSnapshotSet.
VSS_E_UNEXPECTED_PROVIDER_ERROR	0x8004230FL	Calling several methods supported by the providers.
VSS_E_CORRUPT_XML_DOCUMENT	0x80042310L	XML document unexpectedly does not match schema.
VSS_E_INVALID_XML_DOCUMENT	0x80042311L	An XML document passes as an argument is not valid, i.e., is either not correctly formed XML or does not match the schema.
VSS_E_MAXIMUM_NUMBER_OF_VOLUMES _REACHED	0x80042312L	We cannot add any more volumes since we passed the maximum limit.
VSS_E_FLUSH_WRITES_TIMEOUT	0x80042313L	VSS couldn't flush I/O writes anymore.
VSS_E_HOLD_WRITES_TIMEOUT	0x80042314L	VSS couldn't hold I/O writes anymore.

VSS_E_UNEXPECTED_WRITER_ERROR	0x80042315L	VSS encountered problems while sending events to writers.
VSS_E_SNAPSHOT_SET_IN_PROGRESS	0x80042316L	StartSnapshotSet was called when another snapshot set in in the process of being created.
VSS_E_MAXIMUM_NUMBER_ OF_SNAPSHOTS_REACHED	0x80042317L	AddToSnapshotSet was called on a volume that has already reached its maximum number.
VSS_E_WRITER_INFRASTRUCTURE	0x80042318L	The Writer infrastructure is not operating properly. Check that the Event Service and the Volume Snapshot Service are started and check for errors associated with these services in the error log.
VSS_E_WRITER_NOT_RESPONDING	0x80042319L	A writer did not respond to a GetWriterStatus call. This means that the process containing the writer died or is hung.
VSS_E_WRITER_ALREADY_SUBSCRIBED	0x8004231AL	A writer has already successfully called the Subscribe function. It cannot call subscribe multiple times.
VSS_E_UNSUPPORTED_CONTEXT	0x8004231BL	Attempt to use an unsupported context.
VSS_E_VOLUME_IN_USE	0x8004231DL	Calling ChangeDiffAreaMaximumSize
VSS_E_MAXIMUM_DIFFAREA_ ASSOCIATIONS_REACHED	0x8004231EL	Calling AddDiffArea.
VSS_E_INSUFFICIENT_STORAGE	0x8004231FL	Calling EndPrepareSnapshots, ChangeDiffAreaMaximumSize
VSS_E_NO_SNAPSHOTS_IMPORTED	0x80042320L	Calling ImportSnapshots, no volumes were successfully imported.
VSS_S_SOME_SNAPSHOTS_NOT_IMPORTED	0x00042320L	Calling ImportSnapshots, some volumes were not successfully imported.
VSS_E_WRITERERROR_ INCONSISTENTSNAPSHOT	0x800423F0L	Indicates that the snapshot contains only a subset of the volumes needed to correctly backup an application component.
VSS_E_WRITERERROR_OUTOFRESOURCES	0x800423F1L	Indicates that the writer failed due to an out of memory, out of handles, or other resource allocation failure.
VSS_E_WRITERERROR_TIMEOUT	0x800423F2L	Indicates that the writer failed due to a timeout between freeze and thaw.

VSS_E_WRITERERROR_RETRYABLE	0x800423F3L	Indicates that the writer failed due to an error that might not occur if another snapshot is created.
VSS_E_WRITERERROR_NONRETRYABLE	0x800423F4L	Indicates that the writer failed due to an error that most likely would occur if another snapshot were created.
VSS_E_WRITERERROR_RECOVERY_FAILED	0x800423F5L	Indicates that auto recovery of the snapshot volume failed.

Glossary

This glossary defines acronyms and terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

API Application Programming Interface, an interface that allows a software application to connect to and work with a third party software application.

clone A full copy of a volume, usable by an application.

CV HP StorageWorks CommandView, a browser-based interface that allows management of an HP disk array.

differential copy A copy of a database consisting only of the differences in the database since the last full copy.

disk array A RAID. A collection of disk drives within a cabinet or multiple cabinets and including a controller and software allowing drives to be ganged together in various configurations to create virtual drives (LUNs).

EVA HP StorageWorks Enterprise Virtual Array.

FC Fibre Channel, a fiber optic interconnection standard commonly used for storage area networks.

GUI Graphical User Interface.

HBA Host bus adapter. The FC interface card that installs in a host to connect the host to a fabric SAN.

HWP	Hardware Providers. A collection of software that executes on the host, a bus adapter, and the disk array to enable managing and/or copying of array LUNs through the Windows OS and applications.
LAN	Local Area Network.
LUN	Logical Unit Number. A physically addressable storage unit as surfaced by a hardware RAID subsystem. A virtual disk, consisting of multiple portions of physical disks addressed as a single unit.
mirror	Synonymous with “clone.”
MSA	HP StorageWorks Modular Smart Array.
plex	A Microsoft term denoting a full copy of data that has been split off from the original and is no longer being updated. Synonymous with “split mirror.”
PVOL	Primary volume. Typically the volume where application data is stored.
RAID	Redundant array of independent disks.
SVOL	Secondary volume. The volume that receives backup copies of data.
SAN fabric	The Fibre Channel hardware and cabling that connects servers to storage devices in a Storage Area Network (SAN) is referred to as a “fabric.” A fabric switch provides automatically-switched connectivity between servers and storage in the fabric.
SNMP	Simple Network Management Protocol.
shadow copy	A Microsoft term describing a point-in-time copy of an original volume. The original volume continues to change as the process continues, but the shadow copy of the volume remains constant.
snapclone	An HP EVA disk array term denoting a full copy of a volume that becomes immediately usable by an application. Created much faster than ordinary clones by taking a snapshot and updating to a full copy in the background.
snapshot	A generic term meaning a static point-in-time copy of a volume, typically used for backup.

split mirror	A full copy of data that has been split off from the original and is no longer being updated.
subsystem	Synonym for “disk array” or “RAID.”
SVP	Service processor. A laptop PC built into the HP XP Disk Array. The SVP provides a direct interface into the disk array, and is used by the HP service representative only.
volume	Generic term for a number of physical disks or portions of disks logically bound together as a virtual disk containing contiguous logical blocks. Volume can also be software shorthand for a mapped volume (Windows drive letter or mount point).
VDS	Microsoft Virtual Disk Service, the Windows service that manages storage through hardware providers.
volume shadow copy	See “shadow copy.”
VSC	Volume Size Configuration, a feature of HP disk arrays that allows creation of logical volumes custom-sized according to user requirements.
VSS	Microsoft Volume Shadow Copy Service, the Windows service that creates data copies. Works through HP HWP to make copies of disk array volumes.
XP	HP StorageWorks XP Disk Array.

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